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United States Department Of Agriculture | Forest Service | Shasta-Trinity National Forests

Reply To: 3420 Date: May 30, 1989

Subject: Biological Evaluation of Tree Mortality in the ~~Kinyon~~ Spotted Owl Habitat Area, McCloud RD (Report No. N89-9)

To: Forest Supervisor, Shasta-Trinity National Forests

On May 10, 1989, Dave Schultz, Entomologist, Terry Brumley, Forest Wildlife Biologist, and I met with Bill McBain, Timber Operations Officer, Dirk Chandler, Small Sales Officer, and Debbie Selby, Wildlife Biologist, on the McCloud Ranger District to evaluate tree mortality in the Kinyon spotted owl habitat area (T. 40 N., R. 1 E., section 30). The amount of mortality, mainly ponderosa pine, has increased significantly in the past 2 years.

The stands are 2- and 3-layered, although they are probably even-aged. The upper layer is principally ponderosa pine with some white fir, Douglas-fir, sugar pine, and incense-cedar. Most of these trees are 18+ inches dbh. The second layer is made up of the same species with an increase in the proportion of white fir and Douglas-fir. Most of the trees are pole-size. The ponderosa pines in this layer have small crowns and low live crown ratios. The third layer, which often merges with the second, is regeneration size and includes the above listed species, although the amount of ponderosa pine regeneration is limited. Princespine is the more common shrub, but there is little shrub and forb ground cover. Although it is a relatively good site, stocking levels are high compared to normal yield tables for such stands.

Spotted owls have not been observed in this area. The area was not considered high quality habitat for owls, partly because of the large amount of ponderosa pine in the overstory.

We observed pockets of ponderosa pine mortality scattered in the area, at least in the alternate core and adjoining non-habitat areas. Many of the trees had died in the past 1-2 years and still retained dead needles. Older snags were in some pockets and downed logs were also present. Many of this year's dead trees had much of their bark stripped off by woodpeckers. They also had large red pitch tubes around the base. Both of these indicate successful bark beetle attacks, namely, western pine beetle, Dendroctonus brevicomis, and red turpentine beetle, D. valens. Chopping into the base of some of these dead trees revealed symptoms characteristic of infection by black stain root disease, caused by Leptographium wageneri.

Black stain root disease infection centers are a common occurrence in the densely stocked ponderosa pine stands on McCloud Flats. Under normal conditions, low levels of ponderosa pine mortality occur annually within these centers. During periods of less than normal precipitation, infected trees are under additional stress and their susceptibility to bark beetle attacks and mortality increases. Because these beetles attract additional beetles to an

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area once an attack is initiated, surrounding lightly infected and uninfected trees may also be attacked and killed because they are in a stressed condition from the lack of adequate moisture. This is what is happening in Kinyon, resulting in higher levels of tree mortality focused on these root disease centers.

Another disease that is present in the area that can influence stand management decisions is white pine blister rust, caused by Cronartium ribicola. This introduced fungus attacks sugar pine and can cause tree mortality, especially of smaller size classes.

BIOLOGIES OF PEST ORGANISMS

Black Stain Root Disease. The fungus, L. wageneri, is present in the roots and lower bole of ponderosa pine in this area. It causes a vascular wilt type of disease and does not decay woody tissue. The fungus initiates new centers when root feeding beetles, probably Hylastes macer, carry it to the roots of trees. The little information available indicates that the rate of initiation of new centers is low. Following introduction, the fungus grows through the vascular system, blocking tracheids and possibly producing a toxin. This reduces the tree's ability to supply water to its crown and makes it more susceptible to attack by Dendroctonus bark beetles. In addition to growing up the xylem, the fungus will grow through roots and infect surrounding ponderosa pines either through root contacts or through the soil. This leads to expanding centers of root disease. Average annual rate of radial spread is estimated to be 3-4 feet, but some centers increase in size more rapidly.

In other areas, certain site and stand conditions appear conducive to this disease. Observations suggest that these same conditions hold true on the Flats. Stand density strongly influences the disease. Densely stocked stands have a higher incidence of infection. Also, stands comprised predominantly of ponderosa pine have more disease. Low lying, wetter sites tend to be more affected and have higher rates of spread.

Western Pine Beetle. This insect, D. brevicomis, successfully attacks stressed ponderosa and Coulter pines, introducing blue stain and causing tree mortality. Successful adults lay eggs in galleries carved in the inner bark. The eggs hatch into larvae which bore for a short distance in the inner bark, then turn outward to the outer bark where they complete development as larvae and pupate. After pupation, the adults emerge and fly up to several weeks while maturing before they will attack another tree. In the McCloud Flats area, 2 to 3 generations of western pine beetle will develop each year. Successful attacks and mating are strongly dependent on the production of pheromones and other chemical attractants by the insect and the host tree.

There appears to be a correlation between successful attacks and tree condition. Initial successful attacks tend to be on trees stressed by conditions such as root disease, drought, overstocking, severe wounding, air pollution, etc. After one tree has been successfully attacked, pheromones may attract enough beetles to the area to attack and overcome surrounding less stressed trees.

MANAGEMENT ALTERNATIVES

1. No Action. Stand management activities would not occur. Tree mortality will continue, although at lower levels once precipitation returns to more normal levels. Mortality will be concentrated in root disease pockets and be focused on more severely infected trees. Most root disease centers will continue to expand as long as host root contacts are available. The number of snags and down logs will increase. Existing regeneration-size white fir, Douglas-fir, and sugar pine in openings created by the root disease should respond to the increased growing space and light and begin growing at higher rates. Some additional regeneration may occur in openings, but will be limited by the lack of bare mineral soil. Sugar pine regeneration will be highly susceptible to blister rust and most will not survive past pole-size.

Slowly, the stands will convert to a more mixed species canopy, with Douglas-fir and white fir the principal species. This may take a century or longer. In the meantime, mortality pockets will enlarge and canopy cover will decrease.

2. Salvage. Timber volume would be recovered with the harvesting of dead pines. This would have little effect on stand or disease conditions. Pine mortality would continue to occur in root disease pockets. Removal of some dead trees would increase the amount of light reaching the regeneration and increase their rate of growth. By scarifying the soil during harvest, additional regeneration can be expected. Care should be taken to minimize damage to residual trees, especially white fir and any regeneration, during harvesting activities.

3. Habitat Management. Appropriate silvicultural prescriptions would be prepared for stands in the SOHA to maintain and improve the habitat. In general, stocking would be adjusted to levels appropriate to the site. In most cases, this could be accomplished by a low thinning to remove suppressed and intermediate trees, especially ponderosa pine. Some codominant or dominant ponderosa pines may also be removed to release white fir and Douglas-fir in the understory and accelerate the development of a more species diverse canopy. Larger root disease centers would be cleared of ponderosa pine. Although probably not necessary, Douglas-fir and white fir could be planted in these small openings to more rapidly regenerate the site and reduce future effects of the root disease.

Tree mortality levels would be expected to decrease as growing conditions improve. Root disease centers would continue to expand, but probably at a slower rate. Individual centers may not attain as large a size because of the greater distance between ponderosa pines, the larger number of non-pine roots in the soil, and the reduced number of pine to pine root contacts.

In time, stands in this SOHA would become more species diverse and develop a more multi-layered canopy. Some pine mortality would continue around existing root disease centers, but the number of trees and the rate of spread would be reduced. Some root disease pockets would die out with the lack of host trees to infect. Even though losses from black stain root disease would be reduced, stocking in the stands will need to be maintained at appropriate levels to minimize other density associated problems.

If you have questions about this report or need additional assistance, please contact Dave Schultz or I in the Shasta-Trinity S.O. (916-246-5101).

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